

CLAIMS:

1. An illumination device (100), comprising:
5 an incoherent solid state light source (110) adapted to emit light over at least one light emission surface (112) and having a total light emission surface area S_0 ; and
a reflective cavity (120) having an entrance aperture (122) adapted to receive the light from the incoherent solid state light source (110) and a light extraction aperture (124) adapted to output the light from the incoherent solid state light source (110),
10 wherein a surface area S_1 of the light extraction aperture (124) of the reflective cavity (120) is smaller than the surface area S_0 .
2. The illumination device (100) of claim 1, wherein the incoherent solid state light source (210) consists of a single extended LED.
- 15 3. The illumination device (100) of claim 1, wherein the incoherent solid state light source (210) comprises an array of LEDs.
4. The illumination device (100) of claim 1, wherein the light extraction aperture
20 has a rectangular shape and an aspect ratio of 16:9.
5. An illumination device (100), comprising:
an incoherent solid state light source (110) adapted to emit light over at least one light emission surface (112) and having a total light emission surface area S_0 ; and
25 a reflective layer (129) disposed directly on and covering the incoherent solid state light source (110) and having therein an opening (124) for outputting the light from the incoherent solid state light source (110),
wherein a surface area S_1 of the opening (124) of the reflective layer (129) is
smaller than the surface area S_0 .

6. The illumination device (100) of claim 5, further comprising a refractive index matching material disposed on an area of the first surface that is not covered with the reflective layer.

5 7. The illumination device (100) of claim 5, wherein the opening has a rectangular shape and an aspect ratio of 16:9.

8. An illumination device (200, 300, 400, 500, 600), comprising:
an incoherent solid state light source (210) adapted to emit light over at least one
10 light emission surface (212) and having a total light emission surface area S_0 ;
a light circulation device (220) including
at least one light receiving surface (222) adapted to receive the light from
the incoherent solid state light source (210), and
a light extraction area (224) having a surface area S_1 ; and
15 light extraction means (230) for extracting the light from the light circulation device
(220) at the light extraction area (224),
wherein S_1 is smaller than S_0 .

9. The illumination device (200, 300, 400, 500, 600) of claim 8, wherein the light
20 circulation device (220) comprises a solid light guide.

10. The illumination device (200, 300, 400, 500, 600) of claim 9, wherein the light
circulation device (220) further comprises a reflective material disposed on a surface of the
light guide which does not support total internal reflection.

25 11. The illumination device (200, 300, 400, 500, 600) of claim 8, wherein the light
circulation device (220) comprises a hollow cavity.

12. The illumination device (200, 300, 400, 500, 600) of claim 8, wherein the light
30 extraction means (230) comprises a light collimating structure.

13. The illumination device (200, 300, 500, 600) of claim 8, wherein the light extraction means (230) comprises a compound parabolic collimator.

14. The illumination device (400) of claim 8, wherein the light extraction means
5 (450) comprises a prismatic optical component.

15. The illumination device (300) of claim 8, further comprising a reflective polarizer (340) disposed in an optical path between the light extraction area (224) and the light extraction means (230),
10 wherein the light circulation device (220) includes at least one diffusing reflector (339) disposed at a sidewall thereof.

16. The illumination device (300) of claim 8, wherein the light circulation device (220) includes at least one specular reflector (339) disposed at a sidewall thereof, said
15 illumination device (300) further comprising:
a reflective polarizer (340) disposed in an optical path between the light extraction area (224) and the light extraction means (230); and
a quarter wavelength foil (345) in an optical path between the specular reflector (339) and the reflective polarizer (340).

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17. The illumination device (400) of claim 8, wherein the light circulation device (220) includes at least two light receiving surfaces (222) and the incoherent solid state light source 210 includes at least two light-emitting components, each light-emitting component being disposed adjacent to and confronting a corresponding one of the light receiving
25 surfaces (222).

18. The illumination device (500) of claim 8, wherein the light circulation device (220) has a cross-section whose thickness is less near the light extraction area (224) than at the light receiving surface (222).

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19. The illumination device (600) of claim 8, further comprising:
a second incoherent solid state light source adapted to emit light over at least a
second light emission surface (212),
wherein the light circulation device (220) includes at least a second light receiving
5 surface (222) adapted to receive the light from the second incoherent solid state light
source (210), and
wherein the two incoherent solid state light sources each emit light having a
different spectral color.
- 10 20. The illumination device (100) of claim 8, wherein the incoherent solid state
light source (210) consists of a single extended LED.